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PAMI *Research Update*

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Flexi-Coil Air Seeder - Chickpea Seeding

Introduction

Chickpea production across the prairies has increased dramatically over the past number of years and there is a concern that air seeder metering/air delivery systems may damage fragile chickpea seed. Seed cost is substantial with chickpea due to high seeding rates, so prevention of seed damage by optimizing the operation of the air seeder could result in more efficient pulse production.

Flexi-Coil provided an air cart/air delivery system to determine operating parameters that will minimize chickpea damage.

Project Procedure

A Flexi-Coil 2340 air cart with an air kit mounted on a 45 ft (13.7 m) Flexi-Coil 5000 air drill with 12 in (30 cm) spacing was used for the test. Seed was metered with an externally fluted, extra coarse, metering roll into five delivery hoses. Each hose ran into an Easy Flow Header manifold with nine 1 in (2.5 cm) inside diameter (ID) delivery hoses.

Certified CDC Yuma, CDC Xena, and Desiray were obtained for the air tank/air delivery tests. Moisture content was approximately 13.5% for CDC Yuma and 13% for CDC Xena and Desiray. CDC Yuma was chosen as the main variety for the tests due to a combination of factors including damage susceptibility, potential market value, and high seed costs.

Check seed samples were collected prior to transferring the seed into the air cart. Metering samples were collected using the standard Flexi-Coil calibration method at a simulated ground speed of 4 mph (6.4 km/h). Air tank/air distribution samples were collected in plastic tubs at the end of each delivery hose. Samples were combined from each outlet and divided down for damage assessment.

Chickpea damage was evaluated by two different methods. The first method was by visual inspection of physical seed damage including splits, cracks, or any seed coat penetration.

At a Glance...

Chickpea metering and distribution damage was very low at less than 3% with the Flexi-Coil system for all tested varieties at all tested ground and fan speeds.

Physical seed damage was quantified by removing damaged seeds from the sample and expressing this weight as a percent of the original sample weight. The second assessment method was to quantify hidden damage to the seed. Hidden damage was determined by sending the good, undamaged seeds to an accredited seed lab for germination tests. Total damage was calculated as the sum of percent physical damage plus the percent reduction in germination. Net damage due to seed metering and distribution was calculated by comparing the difference between the physical and germination damage of the treated samples with check samples.

The seed damage tests were conducted with the air tank/air delivery system on a level surface. The manufacturer's seed boots were replaced with a "standard" boot to ensure machine performance was not affected by boot design. A rubber hose was attached to the discharge end of the boot to direct seed into plastic catch tubs.

The air tank/air delivery was calibrated at a simulated ground speed of 4 mph (6.4 km/h) and seed rates of 160 lb/ac (179 kg/ha) for CDC Yuma, 80 lb/ac (90 kg/ha) for Desiray, and 180 lb/ac (202 kg/ha) for CDC Xena.

Metering system damage was measured separately from overall system damage by running samples through the meter at a simulated ground speed of 4 mph (6.4 mph).

Minimum fan speeds were determined at 4, 5, and 6 mph (6.4, 8, and 9.6 km/h) simulated ground speed. Fan speeds were reduced until unacceptable seed flow (pulsed distribution), or line plugging occurred. The fan speed used prior to plugging was determined to be the minimum or base fan speed for a given machine configuration, ground speed, and seed rate.

A series of 12 runs was made to determine the effect of fan speed and ground speed on CDC Yuma chickpea damage. Simulated ground speeds of 4, 5, and 6 mph (6.4, 8, and 9.6 km/h) were run at fan speeds of baseline, baseline plus 15%, baseline plus 25%, and manufacturer's maximum recommended fan speed. Samples from each outlet were collected, combined, and assessed for damage.

One test run was made with Desiray at a seeding rate of 80 lb/ac (90 kg/ha), ground speed of 5 mph (8 km/h), and a fan speed of base plus 25%. Similarly, a single test run was made with CDC Xena at a seeding rate of 180 lb/ac (202 kg/ha), ground speed of 5 mph (8 km/h), and maximum fan speed.

Table 1. Flexi-Coil Ground and Fan Speeds.

Machine	Ground Speed (mph)	Fan Speed	Actual Fan No Load (rpm)	Fan Under Load (rpm)
Flexi-Coil	4	Base	3,400	3,400
		Base + 15%	3,880	3,900
		Base + 25%	4,220	4,250
		Base + 47%, Max. Fan	5,010	5,020
Flexi-Coil	5	Base	3,420	3,430
		Base + 15%	3,910	3,930
		Base + 25%	4,260	4,290
		Base + 46%, Max. Fan	5,010	5,080
Flexi-Coil	6	Base	3,970	3,990
		Base + 15%	4,550	4,570
		Base + 26%, Max. Fan	5,000	5,020

Results and Discussion

Metering system damage with CDC Yuma at 4 mph (6.4 km/h) simulated ground speed with the Flexi-Coil system was very low at 0.1%.

Baseline fan speeds for the Flexi-Coil system with CDC Yuma at 160 lb/ac (179 kg/ha) seed rate were 3,400, 3,420, and 3,970 rpm (no load) at respective ground speeds of 4, 5, and 6 mph (6.4, 8, and 9.6 km/h). All combinations of ground and fan speeds are listed in **Table 1.**

Chickpea damage with the Flexi-Coil system was very low at all tested fan speeds **(Figure 1).**

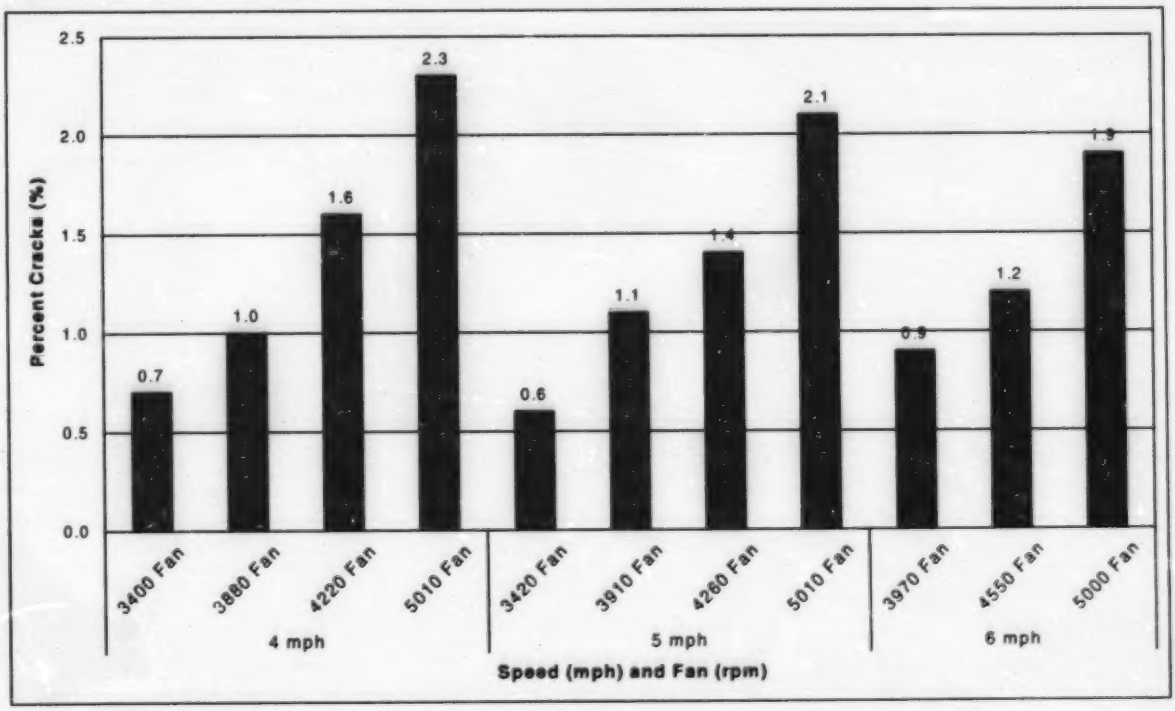
The base fan speed would only likely be used in ideal conditions. The base fan speed plus 25% would be a more typical operating fan speed for field conditions. Although seed damage increased at higher fan speeds, even at maximum fan speed total seed damage was less than 3%.

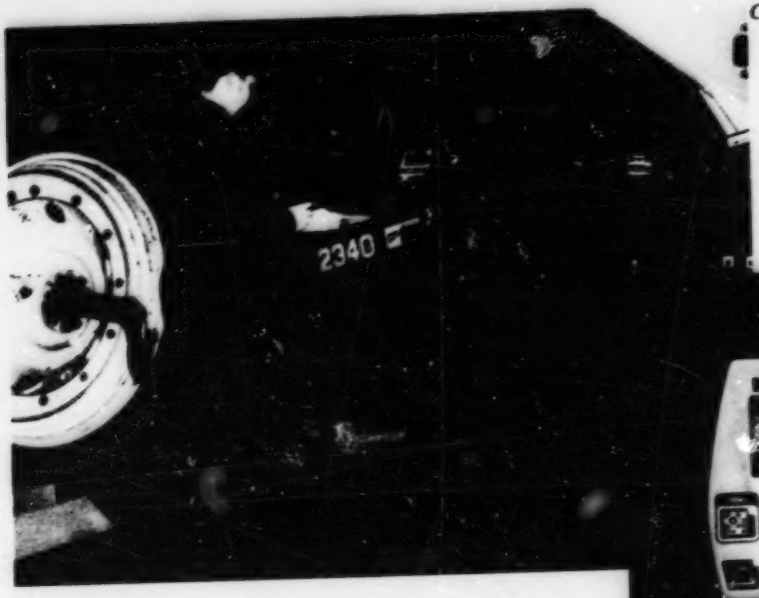
The single air tank/air delivery system test conducted with the two other seed varieties resulted in damage of 0.7% with CDC Xena and 1.2% with CDC Desiray.

These results suggest that seed damage with the Flexi-Coil system is very low with all tested varieties and should not be a concern to producers.

The seed delivery tubes on openers may also affect damage and those with sharper bands or impact points may increase damage. Openers should also be used that have openings to permit the easy flow of the larger chickpeas.

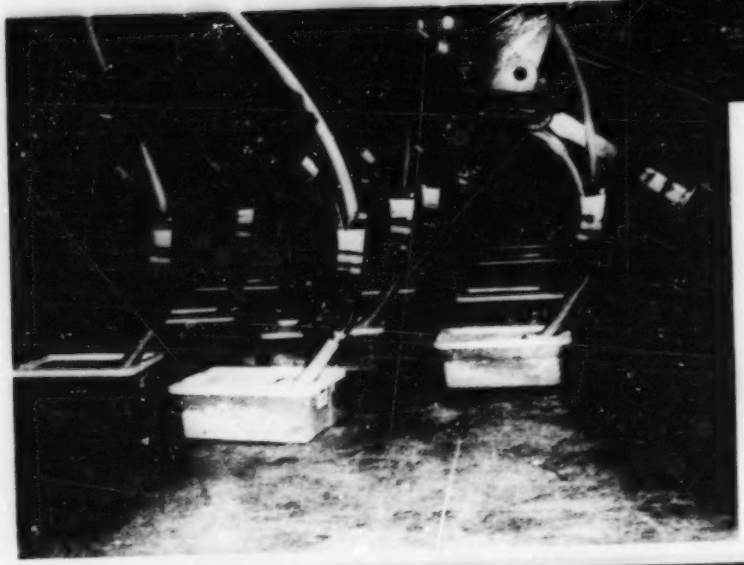
Figure 1. Effect of the Flexi-Coil Ground and Fan Speeds on Chickpea Damage.





Checking mph and rpm.

The Flexi-Coil air seeder monitor.



The collection tubs.

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